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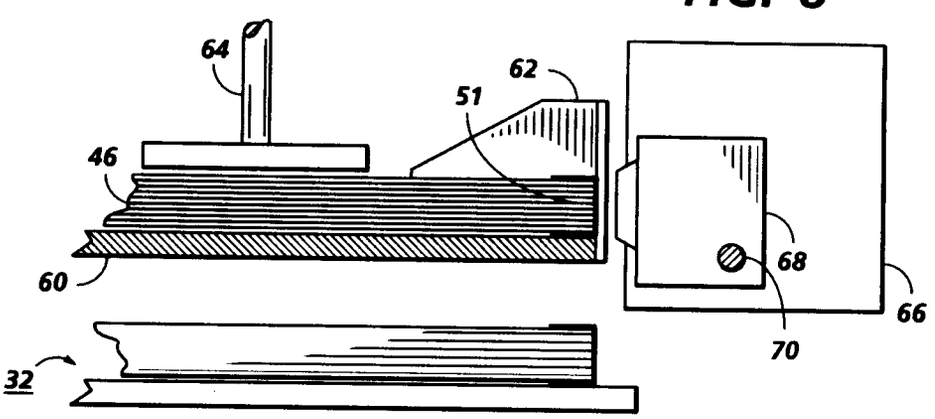
(54) Finisher apparatus.

(57) A document finisher includes a printing station for printing on the binding of a book. The printing station in one embodiment prints on the binder tape before the book is bound. In a second embodiment, the printer (68) prints on the binding (51) after the book is bound. The printing stations are space efficient and designed to be easily incorporated with preexisting stations in document finishers. Ink jet printers and impact-type printer may be utilized.

FIG. 8



EP 0 543 504 A1

The present invention relates to a finisher for a reproduction machine and in particular, to a finisher for providing books or booklets with printed bindings.

It is known in the art to provide finishers for reproduction machines which can provide finished documents in several modes, such as unstapled sets of documents, stapled sets of documents, or bound books or booklets. Such finishers in combination with reproduction machines are shown for example in U.S. Patent Nos. 4,586,680 and 4,985,729. Although this equipment provides bound books, the bindings of such books are blank and, if labeling is desired, it must be applied in a separate step.

However, it has become increasingly important to produce a completely labeled book as a part of the finishing operation. This enhances the usefulness of the booklet to the end user, aids in identifying reproduction job lots and decreases the overall production cost of the book.

An important design constraint for reproduction equipment is that the required floor space is minimized. Therefore, it is desirable to include the printing function in a document finisher without an appreciable increase in space requirements. Further, in order to limit development costs, it is useful to incorporate the printing function with minimal redesign of existing binding stations. Thus, the station must be compact and capable of being easily integrated into existing finishing equipment.

One object of the invention is to enhance the finish state of a book formed in a document finisher.

Accordingly, the present invention provides a finisher for providing books or booklets with printed bindings, including a housing, receiving means within the housing for receiving and assembling a plurality of sheets, holding means within the housing for holding the assembled sheets together and a station within the housing for applying a medium to an edge of said assembled sheets, characterised by printing means also within the housing for printing on said medium.

In another aspect of the invention there is provided binding apparatus including a housing, receiving means within the housing for receiving a plurality of sheets; holding means within the housing for holding said plurality of sheets in aligned relationship to form a stack with an edge of said stack presented for application of a binder tape to said edge; a binder tape supply within the housing for supplying the binder tape; and a station within the housing for applying the binder tape to the presented edge of the stack to bind the sheets together; characterised by a printer within the housing for printing on said binder tape.

In one embodiment there is provided, as a part of a reproduction system, a finisher which applies a binding to form a book and prints information on the binding. The printing arrangements are compact and easily integrated with existing finishing station designs.

The objects of the invention are achieved by incorporating a printing system into a document finisher. In one embodiment, the binder tape is printed and applied to an assembled stack of sheets to form a book. The printing station is integrated with the binding station to minimize space requirements. In another embodiment, a printing station is arranged to print on the binding of a bound book.

The present invention will be described further, by way of example, with reference to the accompanying drawings, in which: –

Figure 1 is a schematic view of a document finisher that accepts sheets from a reproduction machine;

Figure 2 schematically illustrates a side view of a binding station having a thermal ink jet printer for printing on a book binding tape;

Figure 3 is an enlarged view of the printing station shown in Figure 2;

Figure 4 schematically illustrates a side view of a second embodiment of a binding station having a thermal ink jet printer;

Figure 5A and 5B are enlarged schematic illustrations of the printing satin shown in Figure 4;

Figure 6 is a schematic illustration of an end view of a book binding station;

Figure 7 is a sequential illustration of the book binding station of Figure 6 showing application of the binder tape to the book;

Figure 8 is a partial sectional view showing a printing station for printing on the binder of a book; and

Figure 9 is a top view of the printing station shown in Figure 8.

The disclosed finishing system is primarily for use with reproduction or printing equipment, particularly electrophotographic copiers. Referring to Figure 1, a typical document finisher 10 includes a system for accepting printing sheets and applying several different modes of finishing. In the arrangement shown, the sheet input includes a gate 12 that is placeable in a position to feed individual sheets back into the reproduction equipment, for example for duplex processing, by a sheet feed 13. In the alternative position, the gate 12 directs the sheets into a conveying system comprising a plurality of rollers 14 forming a sheet feed path to a gate 16. If the machine control is set for no finishing, the gate 16 directs the sheets into a receiving tray 18.

If collation and further finishing is desired, the gate 16 directs the sheets into a vertical collator 20 that feeds the sheets into a plurality of stacking bins 22a, 22b and 22c. The bins 22 are preferably vertically movable so that finished stacks of sheets can be removed from the bins by the stack transfer belt 24 or other known transfer systems, such as those using pneumatically driven transfer members, that are driven back and forth to place the set clamps 25a and 25b in appropriate positions for moving stacks or finished books. In the arrangement shown, the set clamp 25a is movable toward the bins 22a,b,c and draws stacks therefrom to a pivoted stack receiver 26 which can present a stack to a stapling station 28 or to a binding station 30. Unbound but collated stacks or stapled or bound stacks are positioned at a stacker station 32 by the second set clamp 25b. Alternatively, the stacker station 32 can include a binder printing station, as will be described.

As previously mentioned, a book with a printed binder can be made by preprinting on a binder tape that is applied to an edge of a stack of sheets or printing on the spine of a book after the binder has been applied to the stack to form a book. The arrangement shown in Figure 2 is a system in which the binder tape is preprinted before application to an assembled stack of sheets. The printing system may be configured, by appropriate controls, to print characters vertically or horizontally on the tape 34. Typically, binder tape supply reel 33 carries the supply of binder tape 34. The binder tape 34 carries a heat activatable adhesive on one surface 34b (Figure 3). In the arrangement shown in Figures 2 and 3, the binder tape 34 travels from supply reel 33 to a series of rollers 35, including a tension roller 35a. The binder tape feeds over guide roller 37 to a roller 38, that can be utilized as an encoder roller for providing control signals for a printer, such as thermal ink jet printer 36. The non-adhesive bearing surface 34a is disposed to receive ink deposited by the thermal ink jet printer 36 as the tape moves. The printer 36 includes a cartridge 36a which is mounted to move transversely to allow the printer head to shift so that characters can be printed on the spine portion of the tape, the front or back flaps of the tape or a combination of these locations. An ink supply is incorporated in cartridge 36a. As is conventional with thermal ink jet printers, a maintenance station is associated with the printer 36 for maintaining the printer in ready-to-use condition when no printing is taking place. The cartridge is pivotally mounted about the axis of shaft 38 to allow the printer 36 to be positioned in the phantom line position shown in Figure 3. In this position, a maintenance station 39, which provides for cleaning the face of the printer and vacuum priming the printer, can be brought into position by movement in the direction of arrow f_1 by suitable transfer structure (not shown). The printer 36 may also be capable of being moved transversely, in a direction perpendicular to the plane of Figure 3, in order to remove the printer from the binder tape path when no printing is to take place.

If the printer 26 is an impact printer, such as a dot matrix or daisy wheel printer, a suitable platen surface (not shown) is provided to support the tape 34 as the printing takes place.

The binder tape 34 is then turned over on feed roller 40 to present the adhesive bearing side 34b upwardly. Ideally, roller 40 engages the printed surface of the tape only at the outside edges, where substantially no printing has taken place. For example, the roller 40 may have a central circumferential depression (not shown) for providing relief to the printed surface 34a of tape 34. This lessens the likelihood of smearing the ink which has just been deposited on the tape.

The tape printing operation takes place at high speed and is desirable to utilize a relatively fast drying ink so that subsequent handling of the tape does not deface the printing applied to the tape as, the ink must be heat stable so that it can withstand the binding operation.

Figure 4, 5A and 5B show a second embodiment of a binder/printing system having basically the same elements as shown in Figure 2, which are like numbered. In the Figure 4 design, the printer 36 is arranged differently than as shown in Figure 2. In this embodiment, the thermal ink jet printer 36 and its associated cartridge are mounted in a mount 37 to pivot about an axis defined by shaft 37a. The axis of shaft 37a is substantially parallel to the direction of movement of the section of binder tape 34 adjacent to the printer, which is about to receive printing. In the position shown in Figure 5A, the printer is positioned to print on the tape 34 as the tape travels by the printer. When it is necessary to place the printer in a maintenance position, the printer cartridge is pivoted about shaft 37a to raise the face 36b of the printer. In this position, a maintenance station 39 can be advanced linearly in the direction of arrow f_2 by a suitable member, such as an air cylinder (not shown) to be placed against the face 36b of printer 36 to perform the functions associated with the maintenance of thermal ink jet printers. The station 39 can be linearly retracted in the direction opposed to arrow f_3 to a home position disposed on at one side of the tape. This arrangement provides a space efficient, low cost printing station.

Referring to Figures 2, 3, 4, 5, 6 and 7 the printed binder tape is fed into a pair of opposed, grooved edge holding members 45 by the roller 40. The tape 34 is fed past a cutter 43 for cutting

the binder tape 34 to match the length of an edge of a stack of sheets to be bound. After the tape is cut, a pusher (not shown) pushes the tape into the members 45 so that the tape is even with a lateral edge of the stack 46. The edge holding members 45 are initially positioned in alignment to receive the tape 34 fed by roll 40, as shown in Figures 2 and 3. The members 45 are then shifted laterally from the position shown in Figure 3, corresponding to the phantom positions shown in Figure 4, in the direction of arrow f_3. This places the binder tape 34 to be applied to an edge of the stack 46 between the stack 46 and a heated binding head 48. The tape edge holding members 45 are pivotably mounted adjacent the binder plate 48.

The binder tape feeding arrangements shown in Figures 2 and 4 are mounted on a substructure (not shown) that also includes the binder plate 48 and associated elements, such as calipers 49 and heated flappers 50.

Figure 6 shows the condition of the binder station just as the binder tape is about to be applied to the stack 46. In this arrangement, the stack 46 is held on a pivoted tilt bed 52 by a pair of pneumatic clamps 54 to dispose the edge of the stack to be bound in facing relationship to the heated binding head 48. A pair of pneumatic calipers 49 hold the sheets of the stack 46 in compressed condition as the binder tape 34 is applied by the binding head against the edge of the stack to form the spine 51 (Figure 7) of the book.

Figure 7 shows the completion of the binding operation in which the binder tape edges 51a and 51b are wrapped onto the front and rear surfaces of the stack 46. In this operation, the calipers are moved away from stack 46 as the binder flappers 50 engage the edges 51a and 51b of the tape, bend the tape edges upwardly against the side surfaces of the stack 46 and simultaneously heat the tape to activate the adhesive material.

As the binder flappers 50 are raised, they engage the edge holding members 45, pivoting the members 45 upwardly. This results in the release of the edges of the tape from the members 45. Referring to Figure 1, after the binder tape has been applied to the stack, the tilting bed 52 is rotated upwardly and set clamp 25b engages the finished book and deposits it at stacker station 32.

In a third embodiment, a printing station is arranged at the location of the stacker 32 shown in Figure 1. In this arrangement, an unprinted binder tape is applied to a stack 46 in the binder station 30. The bound book is conveyed onto a tray 60 that includes a pair of upstanding locating brackets 62 for positioning a book with the spine 51 facing outwardly. A suitable clamping member, such as a pneumatic clamp 64, engages the book and holds it in place on the tray 60.

A frame 66 is mounted for movement toward and away from the spine 51 and positions a thermal ink jet printing head 68 in a position to print on the spine 56. With respect to the third embodiment, a thermal ink jet printer is especially preferred, as such non-contact printing can achieve good resolution despite wrinkling or other irregularities in the spine 51 of the book. The printing head 68 is transversely movable along a rail 70 to print characters on the spine 56. Thereafter, the finished book can be placed at the stacker 32, as by tilting of tray 60 or use of a suitable transfer system (not shown).

The data printed by the printers 36 and 68 can be entered an input device (not shown), such as a keyboard, of a microcomputer that controls operation of the printer.

The systems disclosed provide the capability to produce books with printing on the spines of the book. They are incorporated into existing equipment designs in a space efficient manner and in a manner that does not require substantial redesign of existing work stations.

Claims

1. A finisher for providing books or booklets with printed bindings, including a housing, receiving means within the housing for receiving and assembling a plurality of sheets, holding means within the housing for holding the assembled sheets together and a station within the housing for applying a medium to an edge of said assembled sheets, characterised by printing means also within the housing for printing on said medium.

2. Printing apparatus incorporating a finisher as claimed in claim 1, characterised by control means for determining images to be printed by said printing means and further printing means for printing images on said sheets prior to their assembly.

3. Apparatus as claimed in claim 2, characterised in that said further printing means comprises an electrophotographic printer.

4. Apparatus as claimed in claim 2 or claim 3, characterised in that said printing means comprises a non-impact printer or an impact printer.

5. Apparatus as claimed in any one of claims 1 to 4, characterised in that said printing means is located upstream of the station for applying said printing medium to the assembled sheets.

6. Apparatus as claimed in claims 1 to 4, characterised in that said printing means is located downstream of the station for applying said printing medium to the assembled sheets.

7. Binding apparatus including a housing, receiving means within the housing for receiving a plurality of sheets; holding means within the housing for holding said plurality of sheets in aligned relationship to form a stack with an edge of said stack presented for application of a binder tape to said edge;

a binder tape supply within the housing for supplying the binder tape;

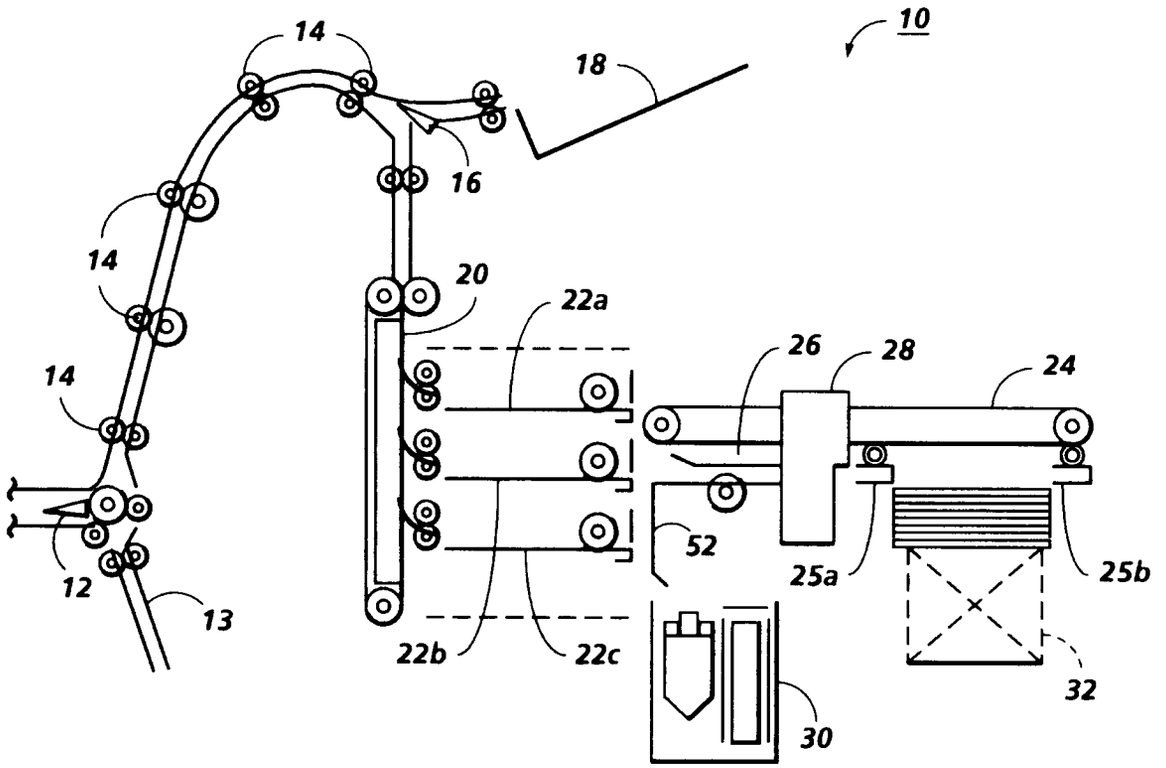
and a station within the housing for applying the binder tape to the presented edge of the stack to bind the sheets together; characterised by a printer within the housing for printing on said binder tape.

8. Apparatus as claimed in claim 7, characterised in that the printer is positioned upstream of said binder tape applying means.

9. Apparatus as claimed in claim 8, characterised in that the printer is located downstream of the binder tape applying station.

10. Apparatus as claimed in any one of claims 7 to 9, characterised in that the printer is pivotally mounted about an axis parallel to the direction of movement of the tape adjacent the printer, toward and away from the tape.

FIG. 1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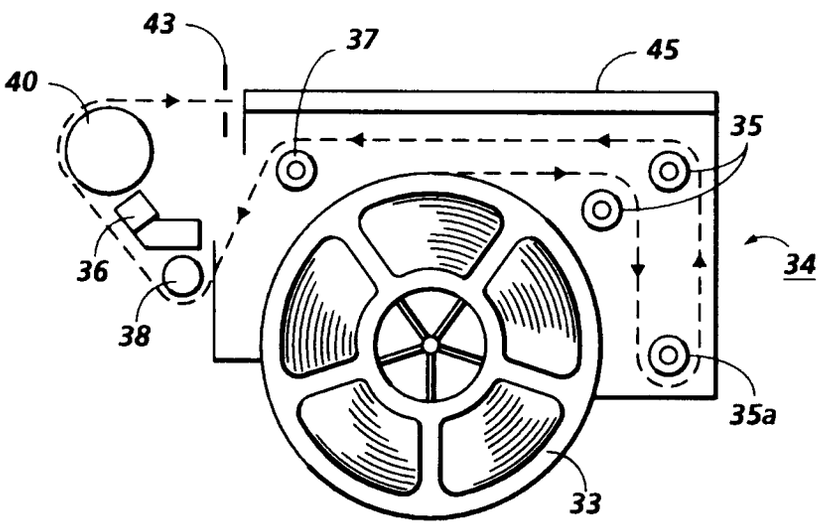
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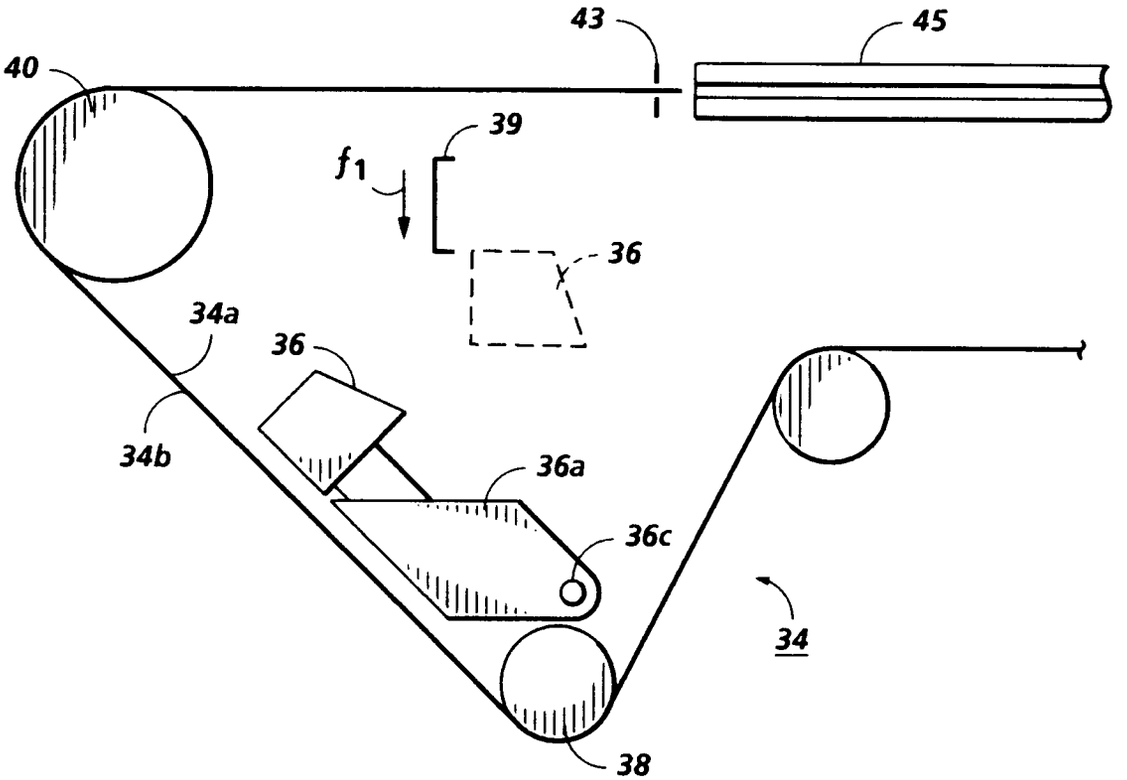
FIG. 2

FIG. 3



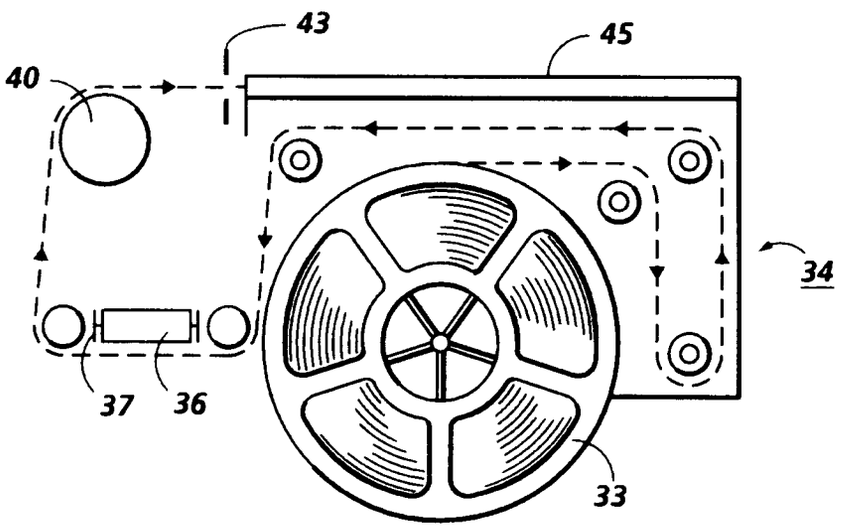
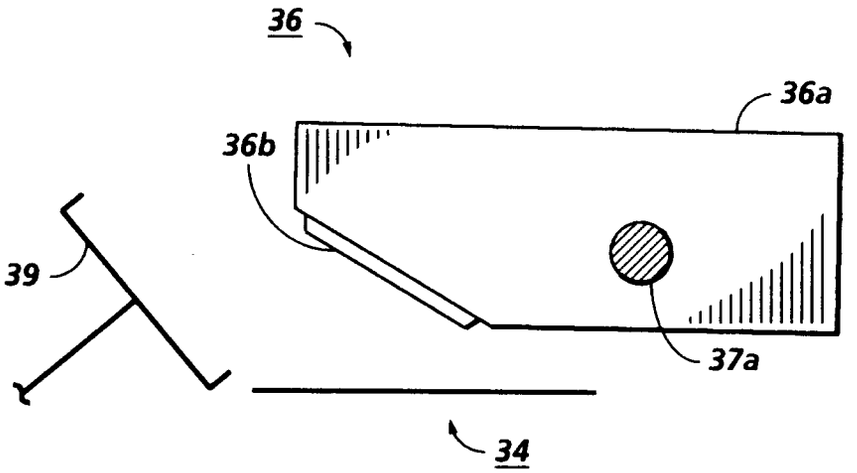


FIG. 4

FIG. 5A



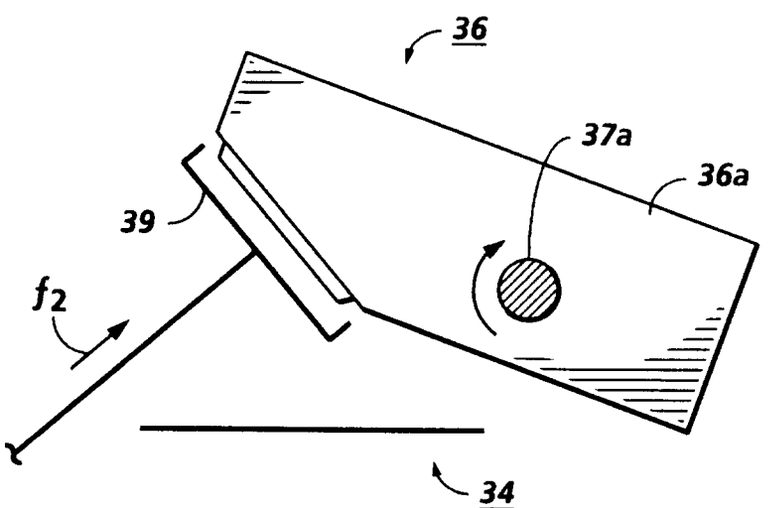


FIG. 5B

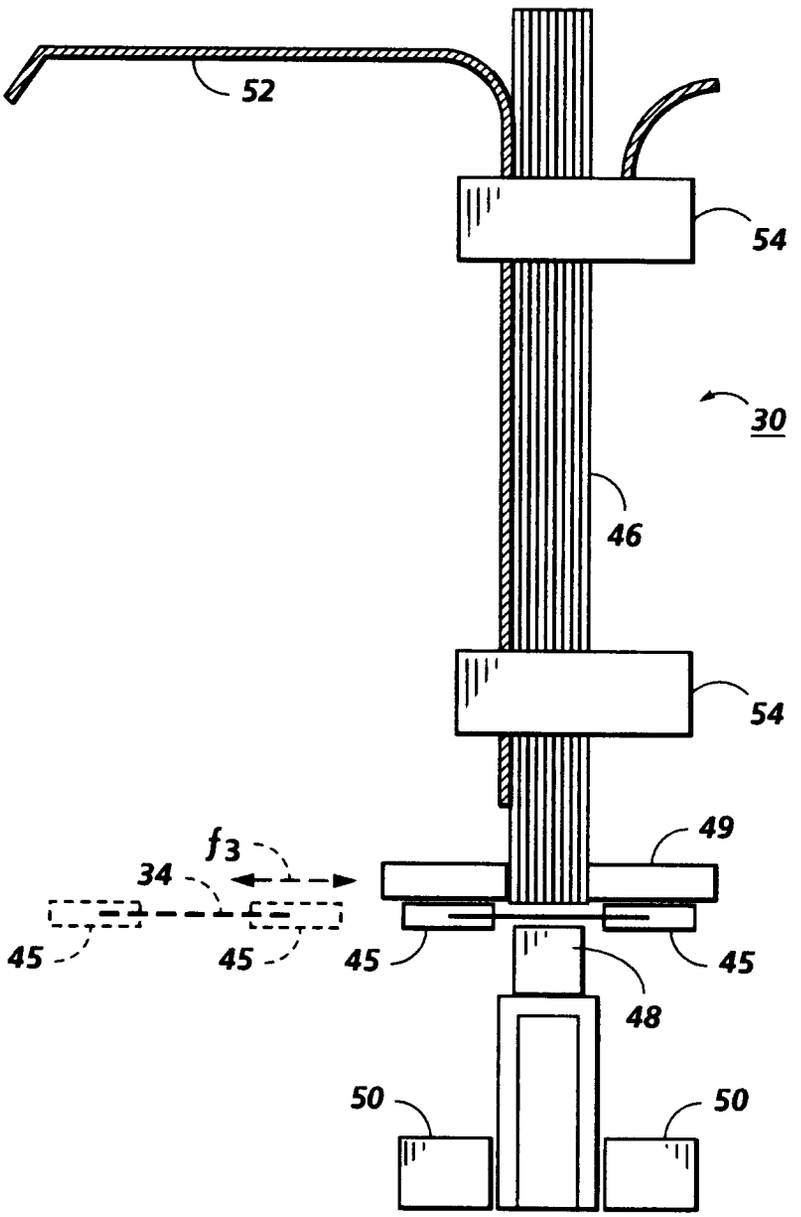


FIG. 6

FIG. 7

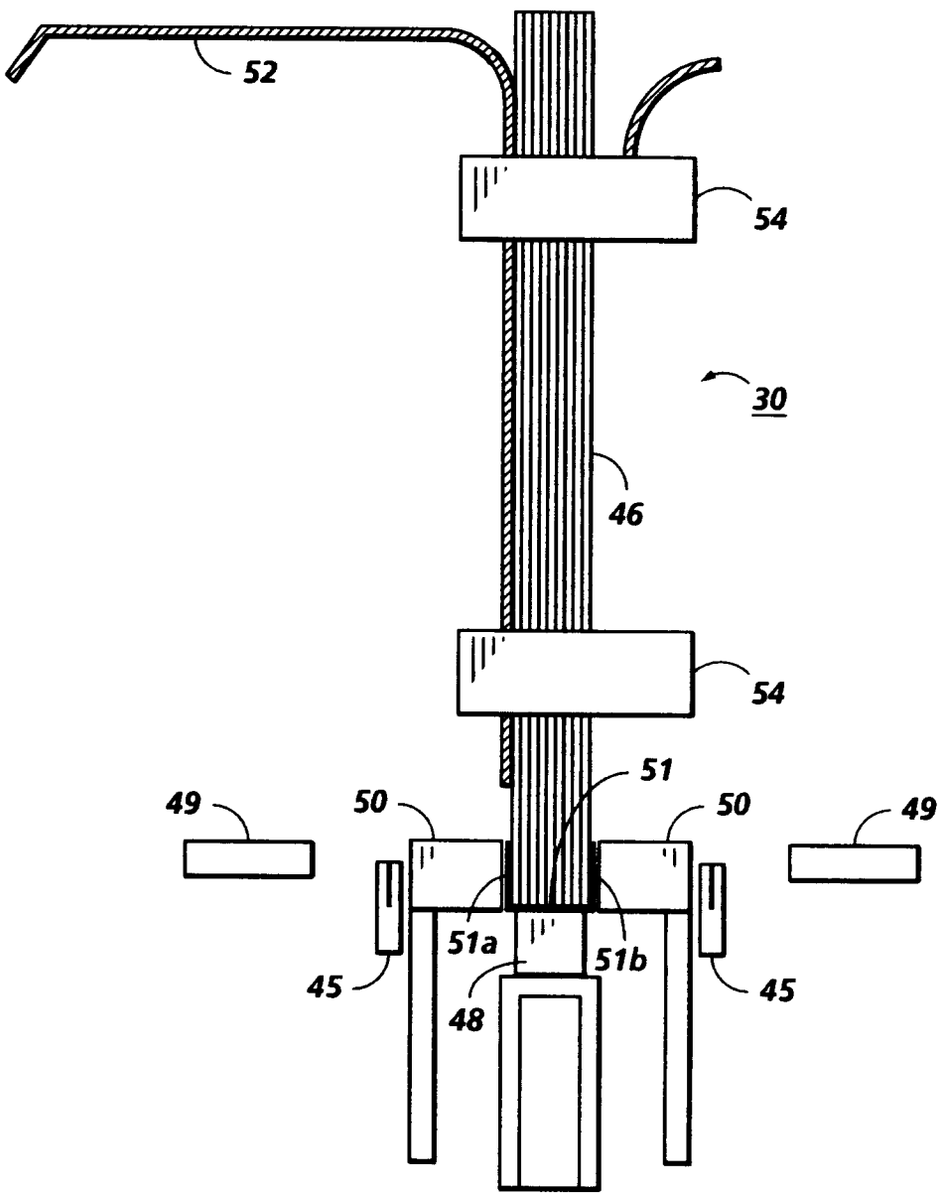


FIG. 8

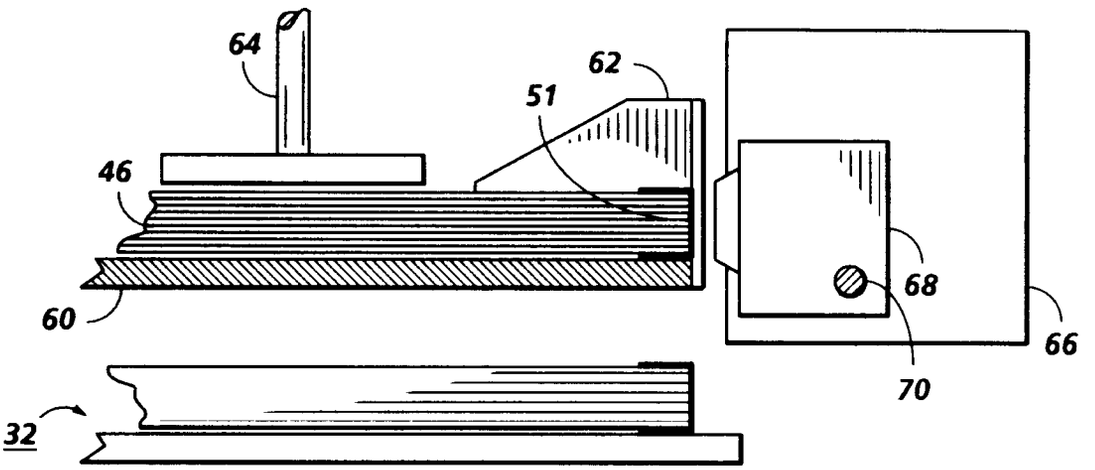
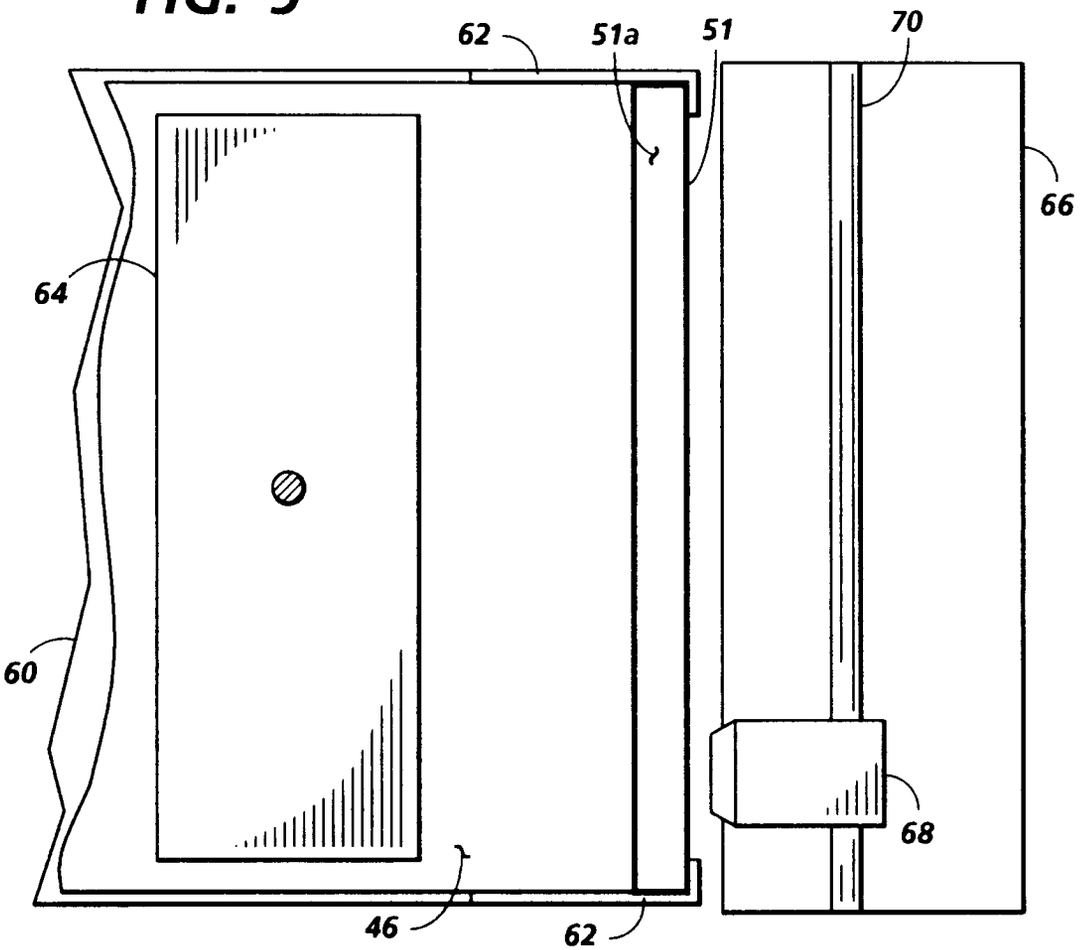


FIG. 9



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 9564

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	US-A-4 985 729 (XEROX)		B42C1/12 B42C9/00
A	US-A-4 352 554 (KAYE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B42C G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01 FEBRUARY 1993	LONCKE J.W.

CATEGORY OF CITED DOCUMENTS

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